Working Paper 1:

GOVERNMENT AVIATION, COMMERCIAL SPACE AND MANUFACTURING

PREPARED FOR
CALIFORNIA DEPARTMENT OF TRANSPORTATION, DIVISION OF AERONAUTICS

PREPARED BY
ECONOMICS RESEARCH ASSOCIATES

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INTRODUCTION

The California Department of Transportation (Caltrans), Division of Aeronautics (Aeronautics) retained Economics Research Associates (ERA) to assess the impact of aviation in California. Caltrans Aeronautics' objectives are to (1) improve the understanding of the economic and quality-of-life impacts of aviation in California among policymakers and planners, segments of the aviation industry and the general public; and (2) identify and address issues related to planning and programming transportation facilities. ERA has structured the assignment to build toward the final report with two working papers. This first working paper, *Government Aviation, Commercial Space Program and Aircraft & Components Manufacturing*, reviews the major impacts and benefits that aviation currently provides to the state of California in three sectors: aircraft manufacturing, commercial space, and government.

In 2002 California faces a different global environment and the sensitivity to the importance of aviation to local and regional economies increased after the September 11th tragedy. Since the previous Caltrans aviation economic study in 1989, the global economy has expanded and the national economies have become much more interconnected. Passenger, cargo and business aviation have increased dramatically. Some military air bases have closed or converted to civilian uses. The aerospace industry has contracted while commercial space activity has expanded.

ROLE OF GOVERNMENT IN AVIATION

The government sector has an important role in California aviation. A number of agencies have responsibilities and activities related to aviation that range from airport operations to the regulation of commercial and general aviation. Many government agencies are also finding that aircraft operations and aviation facilities are of increasing importance to their primary mission. An overview of the federal and California state level agencies with aircraft or aviation programs, including their annual budget, staffing and inventory of aircraft is presented in **Table 1**.

Federal Government

Aircraft and aviation facilities are used by federal agencies in a number of activities including fighting fires, enforcing laws, and facilitating international trade. One major economic benefit to California is the additional federal dollars that return to California because of the federal presence associated with aviation. As the following description of federal agencies and their use of aircraft and aviation facilities will show, the benefits are much broader.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the leading U.S. government agency responsible for the safety of civilian aviation. The FAA (then called Federal Aviation Agency) was established in 1958 by the Federal Aviation Act to regulate commercial and general aviation. It became part of the Department of Transportation in 1967 and was renamed the Federal Aviation Administration.

The mission of the FAA is to provide a secure and efficient aerospace system that contributes to national security and U.S. aerospace safety. The agency's principal operational and regulatory responsibilities include air traffic control, certification of aircraft and aviation personnel, certification of airports, civil aviation security, and environmental standards for civil aviation. The FAA sets standards for civilian aircraft airworthiness, aircraft inspections and licenses, and regulates air traffic control centers. In addition, the FAA investigates air accidents and promotes the development of a national system of airports.

The following is a summary of the FAA's major activities that are performed throughout the U.S. including California:

- **Safety Regulation**: The FAA issues and enforces regulations and standards relating to the manufacture, operation, and maintenance of

aircraft including the certification of airmen and airports, the security of civil aviation, and the transport of hazardous materials.

- **Airspace and Air Traffic Management**: The agency operates a network of airport towers, air route traffic control centers, and flight service stations to provide a safe, efficient, and navigable airspace. It develops air traffic rules, allocates the use of airspace, and provides for the security control of air traffic to meet national defense requirements.

- **Air Navigation Facilities**: The FAA is responsible for the construction, installation and maintenance of aids to support air navigation and air traffic control including visual and electronic aids to air navigation, voice/data communications equipment, radar facilities, computer systems, and visual display equipment at flight service stations.

- **Civil Aviation Abroad**: The FAA promotes aviation safety and encourages civil aviation abroad through aeronautical information exchange, certification of foreign repair shops, airmen and mechanics, providing technical assistance, and negotiating bilateral airworthiness agreements.

- **Commercial Space Transportation**: The agency regulates and encourages the U.S. commercial space transportation industry. It licenses commercial space launch facilities and private sector launching of space payloads on expendable launch vehicles.

- **Research, Engineering, and Development**: The FAA engages in research, engineering, and development aimed at improving the systems and procedures needed for a safe and efficient system of air navigation and air traffic control.

The FAA's field organization is divided into nine geographical regions and two major centers. California is part of the Western-Pacific Region and the regional headquarters is located in Lawndale, California. The regional headquarters is responsible for the air control and other aviation services within Arizona, California, Nevada, and Hawaii. The Western-Pacific region is also responsible for air traffic control throughout the Pacific including Guam and American Samoa.

In California, there is a large FAA presence. There are 63 FAA field offices throughout the state of California with approximately 4,000 FAA employees (out of approximately 5,600 for the entire Western-Pacific region). The average pay for FAA employees in California is $74,118 per year. Although

the FAA's budget is not reported by state, the Western-Pacific region's fiscal year 2002 budget was approximately $1.07 billion.

National Aeronautics and Space Administration (NASA)

The National Aeronautics and Space Administration (NASA) is a civilian federal agency that conducts research and develops operational programs in space exploration, artificial satellites, and advanced aeronautics. A summary of NASA's stated mission is: to advance and communicate scientific knowledge and understanding of the universe, to advance human exploration, use and development of space, and to research advanced aeronautics and space technologies. With an annual 2001 fiscal year budget of about $14 billion, NASA employs 17,700 civil servants and retains thousands of contract employees to work on agency programs. The Agency's annual budget requests include appropriations for human space flight, science, aeronautics and technology, mission support, and auditing and evaluations.

California ranks first by state for total NASA dollars spent and normally receives about 20 percent of NASA's procurement funds. In 1999, NASA spent over $2.4 billion in California. NASA also employs more than 7,200 people at three centers: Ames Research Center (Moffett Field), Dryden Flight Research Center (Edwards Air Force Base), and the Jet Propulsion Laboratory (Pasadena).

The Ames Research Center is situated at Moffett Field in California and employs 1,400 civil servants. The Ames Research Center is an aeronautics research laboratory. This center develops leading edge aerospace technologies and services, conducts research in the Earth, life and space sciences, and develops information systems and technologies enabling NASA missions. The average annual salary at the Ames Research Center is approximately $86,000, a figure that suggests an annual payroll of about $120 million.

The Dryden Flight Research Center is located at Edwards Air Force Base in California's Mojave Desert. It employs approximately 600 civil servants. Dryden's mission is to research and develop advanced aeronautics, space and related technologies. The average annual salary at the Dryden Flight Research Center is approximately $73,000, a figure that suggests an annual payroll of about $44 million.

The Jet Propulsion Laboratory (JPL) is a government owned facility operated by the California Institute of Technology under a NASA contract. The JPL is located in Pasadena, California and employs approximately 5,200 contractors with a payroll of over $300 million. The JPL designs and operates

spacecraft, supports research in automated spacecraft operations, and develops advanced and miniaturization technology for spacecraft.

U.S. Customs

The United States Customs Services (USCS) is the primary enforcement agency responsible for protecting the U.S. borders. Established in 1789 to collect duties on imported goods, Customs is the oldest federal agency. It has protected the U.S. borders and provided the revenues for over 125 years in a variety of ways. It was the precursor to many other agencies through a number of functions: administering military pensions (Department of Veterans Affairs); collecting import and export statistics (Bureau of Census); supervising revenue cutters (U.S. Coast Guard), collecting hospital dues for sick and disabled seamen (Public Health Service); and establishing standard weights and measures (National Bureau of Standards). Customs is currently the second largest source of revenue (behind the IRS) for the U.S. returning more than $22 billion to the U.S. Treasury.

The U.S. Customs enforces import and export compliance with U.S. laws and regulations, collects and protects the revenue, and guards against smuggling. Its principal activities include:

- Assessing and collecting duties, taxes, and other fees on imports,
- Interdicting and seizing contraband including illegal drugs,
- Processing persons, baggage, cargo and mail,
- Detecting and apprehending persons engaged in fraudulent practices designed to circumvent U.S. laws,
- Protecting U.S. business, labor, and intellectual property rights by enforcing U.S. laws to prevent illegal trade practices,
- Protecting the general welfare and security of the U.S. by enforcing import and export restrictions and prohibitions including technologies related to weapons and money laundering,
- Collecting import and export data for compilation,
- Enforcing other laws for at more than 40 agencies including statutes related to environmental protection, consumer safety, public health, and agriculture.

The U.S. Customs Service has approximately 20,000 employees across the U.S. Customs processes over 20 million import entries (representing over $900 billion in value) and 500 million travelers at airports, seaports and border crossings. The annual budget of the USCS for 2001 is $2.3 billion. The Customs FY 2002 budget request totals $2.4 billion.

Customs Inspectors

The U.S. Customs protect the land, sea and air boarders of the U.S. generally at the "ports of entry." Ports of Entry, within the Office of Field Operations at Customs, are responsible for the daily operational aspects of the Customs Service. The responsibilities include maintaining trade compliance (imports/cargo), passenger operations, outbound operations (exports) and anti-smuggling/canine. In addition to processing conveyances, passengers, and all goods entering and exiting the U.S., the Ports of Entry offices enforce 400 laws for 40 other government agencies involved with international commerce. The Ports of Entry policies, process direction and information (from headquarters) flows from the Customs Management Centers (CMCs).

Customs Inspectors perform the variety of inspectional functions at the Ports of Entry. In short, they inspect or search ships, aircraft, baggage, persons, vehicles, and vessels for contraband to prevent illegal drugs and imported merchandise from being smuggled into or out of the U.S. Their activities include:

- Visual and sometimes physical inspection of cargo, baggage, and articles worn or carried by persons or carriers (vessels, vehicles, trains and aircraft) entering or leaving the U.S. at designated stations or ports;
- Weighing, gauging, measuring and sampling to make sure Customs requirements are met;
- Apprehending, searching, detaining and arresting violators of the law;
- Detecting and seizing contraband as well as equipment and vehicles;
- Inspecting records and document;
- Assessing and collecting fees and taxes.

ERA is in the process of collecting information on the number of Customs Inspectors at California airports and their average salaries. Due to the heightened security concerns following the September 11th tragedy, a formal request via the Freedom of Information Act was required.

Air and Marine Interdiction Division (AMID)

The U.S. Customs has an extensive land, marine, and air interdiction force called the Air and Marine Interdiction Division (AMID). Congress established the Air program in 1969 to combat drug smuggling via light, private aircraft. The program became operational in 1971 after the government confiscated a small fleet of aircraft. The stated mission of the AMID is to protect the U.S. borders and people from the smuggling of narcotics and other contraband with an integrated and coordinated air and marine interdiction force. AMID often supports other federal agencies. In FY 2000 AMID efforts help lead to the seizure of 187,000 pounds of marijuana, 43,938 pounds of cocaine, 38 pounds of heroin, 50 pounds of opiates, over $17 million in currency, 200 vehicles, 64 vessels, 13 aircraft, and 205 weapons. In 2001, AMID was appropriated $128 million for operation, maintenance and procurement.

The U.S. Customs Service uses an assortment of aircraft in AMID to conduct surveillance, primarily to detect and interdict suspected smugglers over water and all kinds of terrain. Other duties include supporting the rest of Customs for air or marine surveillance and special tasks associated with homeland security and Olympic airspace security. The Air and Marine branches that make up AMID are strategically located in along the southern border of the U.S. and in Puerto Rico and the Virgin Islands. There is an Air and Marine Coordination Center (AMICC) in Riverside, California which provides command, control, communication and intelligence for the AMID interdiction assets. AMICC assimilates information from a variety of civilian and military radar sites, aerostats and other detection tools to provide 24-hour surveillance along the strategic southern border, provides communications and control to Customs units in operations, and serves as a focal point for tactical coordination between agencies. AMID also has a number of Air Units located at major metropolitan areas to support the enforcement efforts of Customs and other federal agencies.

AMID use a variety of aircraft to detect, sort and intercept their targets. This division currently has 132 aircraft in its air fleet including four-engine P-3s, interceptor jets, tracker aircraft, apprehension helicopters and light helicopters. U.S. Customs Service Cessna Citations and U.S. Customs High Endurance Tracker intercept and track suspect aircraft. C-12M Maritime fixed-wing aircraft are equipped with radar to detect and track boats suspected of drug smuggling. U.S. Customs P-3 AEW (Airborne Early Warning) aircraft help monitor the Southwest border and international waters for smuggling activities. Single-engine airplanes provide aerial support for covert operations. Sikorsky Blackhawk pursuit helicopters provide support for air, land and marine interdiction efforts. The Blackhawks have a variety of missions including evidence relocation, agent transportation, airspace security, and humanitarian

relief efforts. Light Enforcement Helicopters (LEHs) also provide aerial surveillance.

California is a substantial part of the AMID program. Of the approximately $128 million appropriated to AMID annually, the annual budget of the California branches equals $10 million ($2.5 million for operation and maintenance and $7.5 million for salaries and benefits). There are 170 AMID staff members including 46 pilots (some are dual rated for both fixed wing and helicopters). Of the 132 aircraft for the program, 17 are in California. The aircraft include Citations, UH-60 (Blackhawk helicopters), A-Star (LEH), C-12s (Marine Patrol), and a number of single engine planes. Like the rest of the AMID program, the California AMID branches are responsible for the interdiction of contraband across the border (particularly drugs). The California AMID staff also supports the rest of Customs for air or marine surveillance in California and currently have additional responsibilities related to homeland security

U.S. Department of Agriculture Forest Service, Aviation

The U.S. Department of Agriculture Forest Service (USFS) is a federal agency established by Congress in 1905 to provide water and timber for the nation's benefit. Since then its roles and responsibilities have expanded, and the USDA Forest Service now manages public lands in national forests and grasslands for multiple uses including sustained yield of renewable resources such as water, wildlife, and recreation. The principal activities of the USFS are:

- Protecting and managing natural resources on National Forest System lands.
- Researching all aspects of forestry, rangeland management, and forest resource utilization.
- Assisting state and local governments, forest industries and landowners to help protect and manage non-Federal forest, range, and watershed lands in rural areas.
- Helping to formulate policy and coordinating U.S. support for managing the world's forest resources.

The USFS has approximately 30,000 employees and uses aircraft in numerous ways. The aviation missions include operational personnel transport, research, forest rehabilitation, law enforcement support, aerial photography, and fire prevention and suppression. The Forest Service owns and operates 44 aircraft and contracts over 80 aircraft annually including both fixed wing airplanes and helicopters.

The Forest Service Aviation Management (part of the Fire and Aviation Management program) manages the USFS aircraft fleet. Forest Service Aviation Management's primary mission is to support the ground firefighters through aerial delivery of fire retardant and water, aerial reconnaissance, fire intelligence gathering and surveillance, firefighter and cargo transport, and safe delivery of smokejumpers.

Profile of Aerial Fire Fighting

Aerial fire fighting is a critical tool for firefighting. Because of their speed, mobility and retardant delivery capability, aircraft play a distinctive role in contemporary fire control operations. In general, the capability of aircraft are complementary to on-ground firefighting and they often play an important support role. At times they also have unique capabilities indispensable for fighting certain fires; for example, aircraft may be the only equipment that is able to respond efficiently to fires in remote locations.

Aerial firefighting began shortly after World War I when the Forest Service utilized fixed wing aircraft to patrol for wildfires. Next the use of fixed-wing aircraft for smokejumpers started in 1940, and in 1956, the first water and fire retardant drops by fixed-wing aircraft on fires began. The use of helicopters to fight fires began in 1947 for Southern California wildland fires.

The benefits of aerial firefighting are numerous and varied. Aircraft can fly missions for reconnaissance, scouting, or fire mapping. For example, planes can respond to a fire call and relay information of a fire's location, size, and nature back to a ground crew. Today, aircraft in conjunction with the Internet can provide current, accurate assessments to firefighters regardless of their location so firefighters can establish priorities, allocate resources, and develop strategies for handling the fire incident more quickly and effectively. Aircraft can apply a variety of retardants including chemical, water, and foam to slow the early spread of fire and allow more time for ground crews to reach the fire. The planes can also drench hot spots to enable firefighters to get closer to the fire, apply retardant to the path or the head of a fire without endangering firefighters, or drop solution as a backfire barrier. Aircraft also enhance the capability of the ground crew by enabling two to twenty smokejumpers with equipment and supplies to parachute into strategic areas of the fire.

Although the aerial firefighting is an important complement to ground crews, they also have unique features. With an aerial perspective, planes can also notice and extinguish spot fires. They provide the fastest response to fires and if fires escape their initial boundaries, they are an effective support for large-scale containment. Planes can sometimes be more cost effective, flexible and faster than organizing a call-when-needed hand crew to staff fire lines. In

remote terrain, aircraft are invaluable. Helicopters can carry hundreds of gallons of water to hard to reach locations such as steep hillsides on narrow valleys. The terrain might be unsuitable for heavy land-based equipment or might be inhospitable because of the elevation. One of the most important services helicopters provide is the capability to remove injured firefighters from the front lines and deliver them to medical facilities.

USDA Regional Air Group

California has a Regional Air Group that is part of the USDA Forest Service Aviation Management program. In California the USDA Regional Air Group helps administer national USDA contracts for fire suppression through their large fixed-wing, light aircraft, smokejumper, and helicopter programs. The air group helps to inspect equipment and pilots to make sure they meet contract specifications. To provide this contract oversight, the air group inspects aircraft for airworthiness, maintenance, and proper equipment and certifies pilots. The air group will also train and certify the support staff that help to manage the aircraft during field operations. In addition, the air group using a lead plane will also help coordinate aircraft fire drops or other missions to provide an element of safety during fire operations.

The annual budget of the California Regional Air Group is approximately $16 million and about $14 million is for the purpose of contracting aircraft from private firms for potential use. If there is a fire and the aircraft from the group is used, the considerable incremental cost is covered by emergency funds from federal or state sources, depending on the jurisdiction of the fire.

The California Regional Air Group has seven pilots on staff and one helicopter pilot specialist. At the moment, they have five vacancies, four pilot vacancies, and one helicopter specialist vacancy. The group has a total staff of 19 and a fleet of six Beechcraft Barons, one C-23 Sherpa (smokejumper), and one Navajo fixed wing with infra-red capabilities.

U.S. Drug Enforcement Administration

The United States Drug Enforcement Agency (DEA) was established in July 1, 1973 under President Richard M. Nixon. The DEA united a number of federal drug agencies including: the Bureau of Narcotics and Dangerous Drugs (Department of Justice), U.S. Customs Service Drug Investigations (Department of Treasury), Office of Drug Abuse Law Enforcement (Department of Justice), Narcotics Advance Research Management Team (Executive Office of the President), and the Office of National Narcotics Intelligence (Department of Justice). The DEA is the leading agency for enforcing domestic federal drug laws and has the sole responsibility for

coordinating (and pursuing) U.S. drug investigations abroad. It works in close cooperation with federal, state, local, and international law enforcement agencies to address threats from drugs, crime and violence.

The mission of the DEA is to enforce the controlled substances laws and regulations of the United States and to bring to the criminal justice system those organizations and members of organizations involved in the growing, manufacturing, or distribution of controlled substances in the U.S. The DEA's primary responsibilities include:

- Investigation and preparation for the prosecution of violators of controlled substance laws operating at interstate and international levels;
- Investigation and preparation for prosecution of criminals and drug gangs;
- Management of a national drug intelligence program in cooperation with federal, state, local, and foreign officials;
- Seizure and forfeiture of assets traceable to illicit drug trafficking;
- Enforcement of the provisions of the Controlled Substances Act;
- Coordination and cooperation with federal, state and local law enforcement officials on mutual drug enforcement efforts;
- Coordination and cooperation with federal, state, and local agencies, and with foreign governments, through nonenforcement methods such as crop eradication, crop substitution, and training of foreign officials.
- Responsibility, under the policy guidance of the Secretary of State and U.S. Ambassadors, for all programs associated with drug law enforcement counterparts in foreign countries.
- Liaison with the United Nations, Interpol, and other organizations on matters relating to international drug control programs.

In 2001, the DEA had a budget of $1.7 billion with 9,209 authorized positions (4,601 Special Agents and 4,608 support staff).

The DEA aviation program began in 1971 when the Bureau of Narcotics and Dangerous Drugs acquired its first aircraft and as more aircraft were acquired grew into the Special Projects Division. In 1973 the newly formed DEA inherited 24 aircraft and 41 special agents/pilots from the Special Project Division to form the core of the aviation program. In 1994, the Aviation

Section was renamed Office of Aviation Operations (OA) and granted field division status. Today, the OA consists of 95 aircraft and 117 special agent/pilots and the chief pilot is a special agent in charge. The OA headquarters is the Aviation Operations Center located in Fort Worth Texas, Alliance Airport.

The OA provides aviation support to domestic offices throughout the U.S. and several major programs like the Southwest Border Initiative and the National Marijuana Eradication Strategy. The air operations are largely electronic surveillance (air-to-ground, air-to-water, and air-to-air) and photographic reconnaissance. The OA also offices and aircraft in a number of countries in Central and South America for drug enforcement and logistical missions.

Due to sensitivity of the OA's missions, the OA does not answer specific questions about its operations, staffing or budget. DEA special agent pilots are not able to fly until they have at least three years of experience in the DEA. The starting salary of the pilots is generally a GS-9 (approximately $53,000 for law enforcement) but by the time pilots are able to fly they are at a GS-12 (approximately $77,000) or GS-13 (approximately $88,000). ERA estimates the average salary of the OA special agent pilots in California to be similar to the U.S. Border Patrol at $85,000. Since California is twelve percent of the U.S. population, ERA estimates that the California has twelve percent of the aircraft and personnel (eleven aircraft, fourteen special agents). With this staffing level, ERA estimates the OA role in California to have a total budget of approximately $1.1 million.

U.S. Immigration and Naturalization Service, Border Patrol

The United States Border Patrol is the uniformed law enforcement arm of the Immigration and Naturalization Service (INS). Established in 1924 by Congress to respond to illegal immigration, it is now the largest uniformed law enforcement organization in the nation with over 9,000 agents. Its basic mission has not changed in 75 years: to detect and prevent the unlawful entry of aliens into the U.S. and to apprehend those persons found in the U.S. in violation of immigration laws. The Border Patrol is responsible for securing 8,000 miles of international boundaries with particular focus on the area between Ports-of-Entry. The patrol uses a variety of vehicles including aircraft.

The Border Patrol currently (2001) has a staff of approximately 11,000 and a budget of $1.1 billion. In 2000, the Border Patrol had approximately 2,700 agents and 400 support staff in California.

The air unit of the Border Patrol is essential to the fulfilling the Border Patrol's mission. The aircraft efficiently covers thousands of miles of terrain, much of it

in isolated areas. This task would be nearly impossible with land-based vehicles alone. The aircraft are owned and operated by the Border Patrol with a central hub in El Paso, Texas and are housed at leased air hangars (generally at public airports). The air unit has a total budget of approximately $17 million a year and 100 pilots.

The Border Patrol utilizes both fixed and rotary wing aircraft. All the aircraft are crucial observation tools as they can see tracks and other signs over greater distances much better from above. The fixed wing aircraft include the Cessna 172s, Cessna 182s, and Piper Cubs. These low and slow flyers help to identify and track groups through surveillance and observation. The fixed wing aircraft are especially critical to locating and recovering distressed people in the desert during the summer months. The rotary wing aircraft include OH-1s, OH-6s, Hughes 500, MD-600N and UH-1s. These aircraft are used for observation and arrests, because they can track and apprehend groups faster than vehicles on land. OH-6s make up two-thirds of the fleet. The MD-600N helicopters are especially valued because they have no tail rotor and are the quietest helicopter.

In California, there are two Border Patrol air sectors: San Diego and El Centro. The San Diego sector has only rotary wing aircraft, namely light observation helicopters. The helicopters include one UH-1, three MD-600Ns, four MD-500Es, and four OH-6As. The San Diego sector has a staff of 19 pilots, two supervisors, and nine support staff. The pilots earn an average salary of $85,000 and the support staff (mechanics) average salary equals approximately $40,000 suggesting a total estimated budget of two million for the San Diego sector. The El Centro sector has both fixed wing and rotary wing aircraft including three OH-6As (rotary), one Hughes 500C (rotary), one Bell UH-1H helicopter, one Cessna 182, and three Piper Supercubs (fixed wing). El Centro has a staff of eight pilots, one supervisor, and three support staff (two mechanic and supply person). Given the average salary of the pilots and support staff, the El Centro total estimated budget is $900,000.

U.S. Marshal Service

The U.S. Marshal Service (USMS), an agency of the Department of Justice (DOJ), is the oldest federal law enforcement agency. The Judiciary Act of 1789 established the federal judicial system and also created the offices of the U.S. Marshal and Deputy Marshals. The mission of the U.S. Marshal Service is to protect the Federal courts and ensure the effective operation of the judicial system. Its budget hovers near $600 million and approximately 4,000 employees work at the USMS.

While USMS's underlying mission is to enforce the law and execute court orders, the breadth of its primary responsibilities include:

- **Protection of the Judiciary:** The USMS is responsible for the protection of the federal judicial system including judges, witnesses, defendants, and the court facilities during trial proceedings.

- **Fugitive Apprehension:** The USMS execute court orders and arrest warrants for apprehension of fugitives.

- **Seized Assets:** The USMS is responsible for the seizure, maintenance and disposal (through public sales) of assets that have been forfeited under laws enforced or administered by the DOJ.

- **Justice Prisoner and Alien Transportation System (JPATS):** USMS is responsible for housing and transporting prisoners from the time they are brought into Federal custody until they are either acquitted or delivered to their designated Federal prison.

Justice Prisoner and Alien Transportation System (JPATS)

The USMS uses aircraft and aviation facilities for one of their primary responsibilities, to transport prisoners. In 1995 the air fleets of the USMS and the Immigration and Naturalization Service (INS) merged to create JPATS in order to provide a more efficient and effective system for transporting prisoners, detainees, and aliens. The Justice Prisoner and Alien Transportation System (JPATS) is responsible for transporting via air all pretrial and sentenced Federal prisoners and detainees including illegal aliens whether in the custody of the USMS, Bureau of Prisons (BOP), or the Immigration and Naturalization Service (INS). The program also provides prisoner transportation services for the Department of Defense (DOD), Department of State, as well as an increasing number of state and local law enforcement agencies on a reimbursable, space-available basis.

JPATS supports the federal judiciary by scheduling and transporting prisoners to courts and detention facilities around the country and the world. The system performs like a commercial air and bus line system with booking, reservation, and operations. It is the only government operated, regularly scheduled passenger airline in the nation. On average, JPATS moves more than 250,000 prisoners and aliens a year through a coordinated network of aircraft, cars, vans, and buses. In 2001, all movements by JPATS including INS and international movements total 260,000.

The JPATS air fleet enables the government to move prisoners over longer distances more economically and with greater security than through commercial airlines. The fleet is very cost effective- for example, it transports non-federal prisoners for other law enforcement agencies at about 25 percent of the cost of

regularly scheduled airlines. Almost all of the air movements are on aircraft that the Marshals Service owns or leases. The planes used include three Boeing 727s, two DC-9s, two MD-87s, two Sabre 80s and two Cheyenne 3As. Most of the planes were acquired at no cost through the Government Surplus Property Program and the Asset Seizure and Forfeiture Program. The fleet serves approximately 40 cities regularly and every other major city in the U.S. on an as-needed basis.

JPATS has a total of 142 full time employees spread out over six locations, none based in California. There are 30 pilots in the JPATS program based at the Air Fleet Operations headquarters in Oklahoma City and at hubs in Alexandria (Louisiana), El Paso (Texas), Phoenix (Arizona), Anchorage (Alaska), and St. Croix (Virgin Islands). Pilots begin at a GS-12 ($52,000 to $62,000 a year) but with overtime the pilots actually make approximately $75,000 to start.

In California, JPATS uses Travis Air Force Base, Victorville airport, and occasionally San Diego. Other airports are used on an as-needed basis. The aircraft used in California include Boeing 727s, MD-82s, DC-9 and smaller Sabreliners and Hawkers.

U.S. Postal Service (USPS)

The United States Postal Service (Postal Service) is an independent establishment of the executive branch of the U.S. government that is responsible for providing postal services to "bind the Nation together through personal, educational, literary and business correspondence" of the people of the U.S. The Continental Congress established the postal system and appointed Benjamin Franklin as Postmaster in 1775. Today the Postal Service is an integral part of the U.S. economy, delivering hundreds of millions of messages and billions of dollars in financial transactions to 134 million delivery addresses. It is the primary hub of a $900 billion mailing industry. There are approximately 800,000 employees in the Postal Service who help to deliver in volume almost half of the entire world's mail.

Aircraft is critical to the ability of the USPS to fulfill its mission. The Postal Service spent $4.7 billion in 2000 for the contractual transportation of mail, about seven percent of the total postal expenses for 2000. Air transportation costs totaled $1.7 billion in 2000, representing about 36 percent of the total transportation costs. These costs include the use of commercial airlines as well as a dedicated network and taxi service.

The Postal Service is one of the largest users of the commercial airline system. To move almost three billion pounds of domestic mail the Postal Service

contracts with 56 commercial airlines and utilizes approximately 15,000 of the 56,000 daily commercial flights available. To reduce congestion at commercial airline transfer hubs, the Postal Service has an intermodal Hub and Spoke Program (HASP). The HASP is a network of nine hub and spoke facilities nationally supported by a total of 19 aircraft. The aircraft range in size from DC 9s to 747s.

While the Postal Service primarily uses commercial airlines, it also operates its Eagle Hub in Indianapolis, Indiana. The Eagle Hub manages a nighttime network with 28 aircraft that service 46 cities directly to transport more than 800,000 pounds of mail each night. During the 13-day Holiday peak period in the winter, the network also includes a daytime service that moves more than one million pounds of Priority mail. In addition to the Eagle Hub the Postal Service also operates a western dedicated network (WNET) that transports more than 250,000 pounds of mail daily to the Western and Pacific Areas.

The Postal Service spent a total of $160 million in air transportation for international airmail service. The $160 million was paid to U.S. and foreign flag carriers. An additional $138 million was spent in air transportation for military mail which was reimbursed by the Department of Defense (DOD).

Additional California specific information may be forthcoming from the U.S. Postal Service Government Relations Office.

State Government

California State departments and agencies utilize aircraft and aviation facilities for a diverse group of responsibilities and needs from fire fighting to law enforcement to tracking wildlife. The following qualitative assessment of the departments and agencies and their aviation activities illustrate a number of economic and quality of life benefits for Californians.

California Department of Fish and Game

The California Department of Fish and Game (DFG) manages California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The DFG has over 3,000 employees with responsibilities that range from habitat restoration to law enforcement to public education. Aviation is integral to fulfilling some of those responsibilities.

The Air Services, the aviation unit of the DFG, is part of the Conservation Education and Law Enforcement Branch within the DFG. The Air Services branch is based at Sacramento Executive Airport but the pilots and aircraft may be assigned in Hemet, Fresno, and Redding as well as Sacramento. The pilots

and airplanes in the unit provide a number of services to the department including counting wildlife, tracking radio-collared wildlife, patrolling land and coastal areas, taking aerial photographs, and aerially planting of fish in high mountain lakes. Air Services also flies for other agencies such as the Department of Water Resources, Department of Toxic Substances Control, and Fish and Game Commission on an as needed basis for tasks ranging from bio-radio telemetry (for tracking fish like sturgeon, striped bass, and salmon) to personnel transport to aerial photographs.

The annual budget of Air Services is $886,750. They have eight pilots on staff including the Senior Warden Pilot. The pilots also serve as mechanics for the aircraft. Their inventory of aircraft includes four Cessna 185s, two Partenavias, and one Beechcraft Kingair

California Department of Forestry and Fire Protection

The mission of the California Department of Forestry and Fire Protection (CDF) is to "protect the people of California from fires, respond to emergencies, and protect and enhance forest, range, and watershed values providing social, economic, and environmental benefits to rural and urban citizens." The department protects over 31 million acres of California's privately-owned wildlands and provides a diverse range of emergency services to 35 of California's 58 counties through local government contracts.

Each year CDF firefighters, fire engines and aircraft respond to an average of 6,700 wildland fires and 273,000 non-wildfire emergencies. The non-wildfire emergencies include: residential or commercial structure fires, automobile accidents, heart attacks, drownings, lost hikers, hazardous material spills, train wrecks, floods, and earthquakes. The CDF uses both ground and air forces to respond to fire and other emergencies. Without an aviation component, the CDF's ability to fulfill its mission would be severely diminished.

The CDF Aviation Management Program supports its ground forces with airtankers, helicopters and air attack aircraft. The program's air force currently includes thirteen Grumman S-2A 800 gallon airtankers, ten Grumman S-2T 1,200 gallon airtankers, nine UH-1H Super Huey helicopters (plus two helicopters on standby for maintenance relief), and thirteen OV-10A air attack aircraft. There are 22 CDF plane and helicopter bases located statewide so that aircraft can reach any fire within the state in 20 minutes or less.

In a typical fire, air attack planes will fly overhead and direct retardant and water drops by airtankers and helicopters. The retardant used to slow the spread of fire is slurry consisting of a chemical salt compound, water, clay or a

gum-thickening agent, and a coloring agent. At nine pounds per gallon, an S-2A and S-2T can carry 7,200 and 10,800 pounds, respectively.

In addition to fire retardant and water drops, helicopters can also transport firefighters, equipment and injured personnel. During the California fire season the airtankers and air attack planes are stationed at the thirteen CDF bases located statewide. After each fire season, the tankers and air attack plans are based in Mather Airport in Sacramento for the winter. CDF helicopters remain at the seven CDF helitack bases located statewide and are available for service year-round.

The CDF Aviation Management Program has an average annual budget of approximately $15 million. Eighteen CDF personnel oversee the program and another 130 contract employees provide mechanical, pilot and management support. CDF contracts with San Joaquin Helicopters for airtanker, air attack plane and helicopter maintenance. San Joaquin also provides pilots for the airtankers and air attack planes, while CDF pilots fly the CDF helicopters.

California Department of Justice

The California Constitution established the Office of the Attorney General as the state's chief law officer in 1850. The Attorney General is responsible for ensuring that the laws of the state are uniformly and adequately enforced and carries out its responsibilities through the California Department of Justice.

The Department of Justice includes over 4,500 employees, grouped in ten different divisions including the Divisions of Civil Law, Public Rights, Criminal Law, Law Enforcement, Gambling Control, Criminal Justice Information Services, Legal Support and Technology, Firearms, Executive, and Administrative Services. The department's main offices are in Sacramento, Los Angeles, San Francisco, San Diego, Oakland and Fresno.

The Division of Law Enforcement within the California Department of Justice is responsible for maintaining crime suppression programs and supporting other state and local law enforcement agencies through forensic sciences, narcotics investigation, intelligence, and training. Within the Division of Law Enforcement, the Mission Support Branch includes the aviation unit as part of their mission to enhance public safety through training, technical and administrative support for the Division of Law Enforcement and other related agencies.

The Mission Support Branch, Aviation Operations helps the California Department of Justice fulfill its mission primarily through surveillance and transportation of dignitaries. The department has ten staff members including

six pilots, two support staff, and two supervisors with an annual budget of $1.9 million. Their inventory of aircraft includes seven Cessna 182s, one Kingair B200, one Beechcraft Baron B55, three OH-6 helicopters and one UH-1 helicopter. The department contracts out the maintenance of its aircraft.

California Department of Transportation, Division of Aeronautics

The California Department of Transportation Division of Aeronautics' (Caltrans Aeronautics) mission is to assist in developing and preserving "a safe and environmentally compatible air transportation system that meets the economic needs of the state." This division is part of the planning and maintenance infrastructure integral for the safe and efficient development and operation of air transportation in California. In its guiding vision, Caltrans Aeronautics seeks to help develop an air transportation system that will meet the majority of the needs of the aviation community and the general public in a safe, efficient, economically beneficial and environmentally compatible manner. The division's major responsibilities include:

- Inspecting (and issuing permits for) airports and heliports for compliance with safety standards including public use airports and hospital heliports;
- Furnishing technical assistance to airports in design, maintenance, and administration;
- Providing State grants and loans to various entities (cities, counties, districts and airport land use commissions) for safety, maintenance, capital improvement projects and comprehensive land use plans at airports;
- Administering noise regulation and land use planning laws that foster compatible land use and encourage environmental mitigation measures;
- Supplying technical assistance to airport land use commissions to minimize the environmental impact of airports;
- Providing for the integration of aviation into transportation planning on a regional, statewide, and national basis.

Caltrans Aeronautics is a division in the California Department of Transportation that began as the California Aeronautics Commission in 1947. It has a number of offices that perform different functions in support of the Caltrans Aeronautics mission.

- The Office of Airports conducts public use airport and heliport safety and permit compliance. Among other functions, this office inspects airports and heliports, processes permits, evaluates school sites near airports, and assists airport management in complying with state and federal laws and regulations.

- The Office of Aviation Planning develops a plan to assess current and future aviation needs and implementation, coordinate regional transportation planning, facilitates resolution of air quality issues affecting airports and airport users, and serves as a resource and liaison for other agencies concerning aviation.

- The Office of Aviation Programs is the division's fiscal and administrative unit. It administers operating and capital budgets, provides grants and loans to airports for capital improvement projects, analyzes federal and state aviation legislation, and reviews environmental documents for projects on or near airports.

- Office of Technical Services provides airport engineering assistance internally and to local governments, identifies airport pavement needs and estimates capital outlay, administers regulations to mitigate noise impacts, and publishes planning guidelines.

Caltrans Aeronautics has an operating budget of $2.8 million, a staff of 30, and two Beechcraft Bonanza aircraft.

California Highway Patrol

The California Highway Patrol's mission (CHP) is to ensure safety, provide service to the public as they utilize the highway transportation system and to assist local government during emergencies when requested. The officers of the CHP patrol over 100,000 miles of state highways, county roads, and streets within the CHP jurisdiction. The CHP law enforcement duties include enforcing provisions of the California Vehicle Code, drug interception, vehicle theft investigation and prevention, vehicle inspections, accident investigations, public awareness campaigns, and protective services for state officials, employees and facilities.

The CHP is a department in the state government within the Business, Transportation and Housing Agency. It is the largest traffic law enforcement organization in the nation with approximately 10,000 employees. The Commissioner is the chief executive officer of the CHP and is appointed by the Governor and confirmed by the Senate. A Deputy Commissioner assists the Commissioner and supervises two Assistant Commissioners. One Assistant

Commissioner oversees staff-related operations and the other, all field operations. The CHP's field operations consist of 130 Field Area offices, commercial vehicle inspection facilities and communications centers within eight divisions.[1]

The Assistant Commissioner, Field directs the Office of Air Operations which manages the CHP aircraft program. The Office of Air Operations has a staff of 153 and possesses nine helicopters and fourteen fixed-wing planes. The CHP uses the aircraft for speed enforcement, search and rescue operations, emergency medical evacuations and allied agency support. The budget for the Office of Air Operations is approximately $4.1 million.

The nine helicopters in the Office of Air Operations are divided into two programs. The Metropolitan program based in Fullerton has two helicopters, a Bell 0H58 and a Bell 206L3. Each helicopter has one pilot and one EMT flight officer. The rest of the helicopters are in the regional program with one helicopter per field division. There are six Eurocopter AS350B3 and one Bell 206L4. Each of the helicopters in the program is outfitted with the same advanced life support equipment in an ambulance. While all the helicopters are piloted and staffed by CHP officers and have the same mission of providing service to the public by supporting the department and allied agencies, each of the two programs have a slightly different emphasis. The Metropolitan program has a greater role in border patrol and the regional program enables the CHP to fulfill their mission in rural and remote areas. Although the regional program has a law enforcement role, they have an especially critical role in conducting search and rescue, patient transport, and advanced life support in rural or remote areas like the desert.

The fourteen fixed-wing planes in the Office of Air Operations like the helicopter programs share the same mission of servicing the public by supporting the department responsibilities but are all under one program. The fleet is composed entirely of Cessna 206s. The primary responsibility of these planes is to enforce traffic regulations and to relieve traffic congestion. There is one plane in the Golden Gate division, one plane in the Southern division, and two planes in each of the six remaining divisions. Each plane has one pilot and one EMT flight officer and both are CHP officers.

Local Government

The local government section of this working paper will be developed in the next few weeks. With the assistance of JD Franz, ERA will contact the more than 200 public use airports in California to determine their local government

[1] State of California, CHP Monthly Position Count

agency staffing level (including contract staff) to estimate the total local government airport employment and income in California. This task will include a discussion of the aviation functions and services provided by local government.

COMMERCIAL SPACE MANUFACTURING AND SERVICES

California is a global leader in space research, technology, manufacturing, services and transportation. A number of advantages helped to bring California to the leading edge of commercial space including its educational and research infrastructure, its deep supplier base and a long history of aviation industrial development. The golden state currently hosts more aerospace manufacturers than any other state, has three of the six international satellite manufacturers, has two of the five U.S. federal spaceports and is one of four states to have commercial spaceports.

The space industry in the U.S. has evolved from a solely government run and funded space program exclusively for government purposes to one where the government shares space transportation and services with the commercial sector. Instead of funding entire projects with national defense expenditures, the government now purchases committed transponders on commercial satellites for military use or takes advantage of dual use opportunities by providing some funding to build dual use rockets and satellites with the expectation that the rockets/satellites will carry both commercial and government payloads. While some satellites constellations are U.S. government only (such as weather forecasting satellites and "black" (spy) satellites), many of the satellites are privately owned. Consumer and business demand for commercial satellite services are now outpacing government and scientific applications of space technology.

The commercial space industry now includes the commercial launch businesses as well as businesses enabled by commercial space transportation. The manufacture of commercial launch vehicles is a small part of the overall economic activity resulting from space transportation. The launch vehicle manufacturing has promoted the development of rapidly growing enabled industries like satellite manufacturing and satellite communications services. These enabled services already compose more than 90 percent of the total economic activity (direct, indirect and induced impacts) associated with commercial space transportation, and are expected to have much faster growth rates than the launch vehicle industry. The industries associated with commercial space include[2]:

- Launch vehicle manufacture- the commercial launch business includes the manufacture of launch vehicles and the provision of launch services.

[2] ***The Economic Impact of Commercial Space Transportation on the U.S. Economy*** published by the Associate Administrator for Commercial Space Transportation, the Federal Aviation Administration, and the U.S. Department of Transportation, February 2001.

While the commercial launch business constitutes only six percent of the total economic activity associated with commercial space transportation and associated industries, it enables the satellite manufacturing and services industry.

- Satellite and ground equipment manufacturing- Satellite manufacturing is the construction and sale of satellites. Ground equipment manufacturing includes the satellite-related hardware (e.g. gateways and satellite control stations), mobile uplink equipment, Very Small Aperture Terminals (VSATs) and consumer electronics used with satellite services (e.g. Direct Broadcast Satellite dishes, phone booths, and handheld phones).

- Satellite services- Satellite services include end-user services and transponder leasing. End-user services include telephony, VSAT services, mobile data services and direct-to-home television (DTH). Some companies that operate satellites also lease or sell satellite transponder capacity.

- Remote sensing- Remote sensing includes the provision of raw data and satellite imagery services.

The commercial space industry also benefits other distribution industries such as wholesale, retail trade, and transportation that facilitate inter-industry transactions are impacted by commercial space activities.

A recent study by the Associate Administrator for Commercial Space Transportation, Federal Aviation Administration and the U.S. Department of Transportation estimated the economic impact of commercial space transportation on the U.S. economy. The study noted that in 1999 the U.S. economic activity linked to the commercial space industry totaled over $61 billion and nearly 500,000 people who were employed in the U.S. as a direct or indirect result of commercial space transportation and enabled industries. About 92 percent of the economic activity was in satellite and ground station manufacturing and services, six percent was related to launch vehicle manufacturing, and the remaining two percent attributed to distribution industries and remote sensing. The commercial space industry is an enormous one that has a cascading effect on a number of other industries and California benefits from its commercial space industry concentration.

In addition to the direct, indirect and induced economic benefits, the California economy also benefits from the "clustering" high technology research that is related to commercial space. For example, the benefits of clustering are evident in satellite manufacturing. Satellite manufacturing helps to support research,

development, and application of high technology, sponsors entrepreneurial investment, and generates new commercial ideas. There are economic synergies with clusters of high technology industries. For example, commercial space leaders like Lockheed Martin locate in Silicon Valley because the region is a global center of technical innovation, has an excellent education and research base, and retains a highly skilled workforce. At the same time, manufacturing satellites contributes to making California a global region of technical innovation and provides jobs to sustain a highly skilled workforce.

Without the satellite industry, some of the high technology, R&D, entrepreneur investment, and new ideas that are an outgrowth of the industry would also not exist. In addition, the federal government's dual use policies and activities are contributing to more interaction between industry partners and government research facilities so that research clusters like Edwards Air Force Base provide opportunities for licensing new leading edge technologies and cooperative agreements with educational facilities, private organizations, and citizens.

Launch Facilities

One of the most critical and dramatic aspects of the commercial space industry is the launching of satellites and other payloads on massive rockets. Spaceports are the infrastructure backbone of the commercial space industry. They house launch pads and runways as well as provide the equipment and fuel needed to process launch vehicles and their payloads prior to launch. Beginning in the 1950s the federal government built and operated space launch ranges and bases to meet a variety of purposes but over time spaceports increasingly were used for commercial launches. Although U.S. military and civil government agencies are still the primary users of spaceports, commercial payloads are experiencing rapid growth. Given the specific needs and costs of spaceports there are only a limited number in the U.S. California has the highest concentration of launch facilities and enjoys unique and unparalleled access to space. Vandenberg Air Force Base and Edwards Air Force Base in California are two of the five U.S. federal spaceports and the California Spaceport is one of four commercial spaceports in the U.S.

Edwards Air Force Base

Edwards Air Force Base (EAFB) is located in the sparsely populated Western Mojave Desert in the Antelope Valley of California. The facility includes 301,000 acres of land, 65 miles of usable landing area, and 73 miles of marked runways (including a 15,000-foot paved runway). It also has 5.6 million square feet of ramp space, more than 1 million square feet of hangar space, and approximately 1.8 million square feet of technical support facilities.

The Air Force Flight Test Center (AFFTC), the premier location for aerospace research, development, test, and evaluation (RDT&E) of and support for aerospace vehicles, is located at EAFB. This mission includes modeling and simulation, ground and flight testing, launch/flight evaluation, development testing of aerodynamic decelerators and the operation of the USAF Test Pilot School. The AFFTC has the largest and most diverse fleet of general and specific test aircraft and is the Air Force's center of expertise for modifications of test aircraft.

EAFB is co-located with NASA's premier aeronautical flight research center, Dryden Flight Research Center, and the Air Force Research Laboratory's Propulsion Directorate, which oversees rocket test stands. Dryden Flight Research Center is NASA's premier installation for aeronautical flight research. The Air Force Research Laboratory (AFRL) is a world leader in space and missile rocket propulsion technology and has helped to develop nearly every modern rocket propulsion system used in the U.S. The rocket technologies developed at AFRL are the basis for space shuttle solid boosters and main engines and the U.S. commercial launch fleet. The "cluster" of space organizations on the base (AFFTC, NASA, and AFRL) has a formal union called "The Alliance" which improves service and lowers cost of flight testing and research.

The EAFB also has had many historic achievements including:

- In 1947 ASAF test pilot Chuck Yeager broke the sound barrier at EAFB. The EAFB has supported the flight tests of every Air Force vehicle developed since 1947.

- EAFB was the original landing site for the Space Shuttle and still serves as a back-up site for the Space Shuttle.

- Its Test Pilot School supplied one-third of the skilled fliers for the U.S. Astronaut Corps, more than any other source. All three members of Apollo 11 moon landing crew (Armstrong, Aldrin and Collins) were EAFB alumni.

EAFB's natural advantages for aeronautics include extremely favorable year-round weather with precipitation averaging under five inches and more than 345 sunny days per year with low humidity, excellent visibility, availability of all terrain types, and immense natural runways formed by the Rogers and Rosamond Dry Lakebeds. These attributes help to minimize risk and repair dollars for both military and commercial testing and emergencies.

Edwards AFB supports a region of the State that has not benefited from California's robust economy with 7,500 civilian jobs with hundreds of high technology research positions. Approximately fourteen aerospace contractors work at Edwards AFB, including The Boeing Company, Lockheed Martin, and Northrop/Grumman.

One of the most important economic functions that Edwards AFB provides is its substantial RDT&E capability. The Air Force alone at Edwards AFB has nearly 600 scientists and engineers who provide experience and expertise that have contributed enormously to the scientific foundation for aviation and space developments. The AFFTC at Edwards has a Technology Management Office that oversees cooperative agreements with educational facilities, private organizations and citizens to share resources.

In Antelope Valley within Edwards AFB is Air Force Plant 42, a government-owned, contractor-operated facility. Air Force Plant 42 is consists of eight separate production sites on 5,800 acres and a shared runway complex with two 12,000-foot runways. Plant 42 supports the newest and most advanced commercial and military aerospace systems with the assistance of the high-speed flight test corridors at Edwards AFB. Many of the world-class aerospace firms operate at Plant 42 including Boeing, Northrop Grumman, SR Technics/Swiss Air and British Aerospace/Marconi/Tracor. The facility is also home to Lockheed Martin advanced research and development (formerly "Skunkworks"). Boeing and Lockheed Martin both built and tested different versions of the Joint Strike Fighter, the world's most advance fighter aircraft, at Plant 42. Plant 42 also used to provide Space Shuttle refurbishing. Approximately 8,500 employees work in or near Plant 42, representing about $500 million in payroll to the region and State.

Vandenberg Air Force Base

Vandenberg Air Force Base (VAFB) is a 155 square mile installation on the Central Coast of California. Due to its unique geography it is the only location in the continental U.S. capable of launching polar orbit spacecraft without overflight of any landmass. It is the U.S.'s premier polar launch site and has five launch complexes supporting both government and commercial launches. The VAFB provides infrastructure and program support for ballistic and suborbital military and science launches. Because of its geographic location, instrumentation, and resources, VAFB enables a broad range of programs including space, ballistic, aeronautical, guided missiles, experimental vehicles, optical systems, tracking analysis and many others.

Vandenberg Air Force Base is the Headquarters of the 14th Air Force, which is responsible for all the Air Force space programs including spacelift at

Vandenberg AFB and Cape Canaveral, as well as on-orbit space operations worldwide. Under command of the 14th Air Force is the 30th Space Wing (30 SW). The 30th Space Wing conducts and supports space and missile launches and operates the Western Range, a network of launch-related resources and ground stations supporting launch and test flights from California. The VAFB infrastructure includes a 15,000-foot runway, control centers and facilities for launch, payload processing, tracking radar, optical tracking and telemetry. The base houses 53 government organizations and 49 contractor companies spread out over 1,100 buildings.

VAFB partnered with Boeing to develop launch infrastructure for Evolved Expendable Launch Vehicles (EELV), a state-of-the-art family (small, medium and heavy-lift) of expendable launchers. The goal of the EELV program was to partner government with industry to develop a national launch capability that would satisfy dual use payload (government and commercial) requirements and reduce the cost of space access by at least 25 percent. Lockheed Martin and Boeing were awarded EELV production and service contracts for their Atlas 5 and Delta 4 vehicles, respectively. The Air Force provided each company with $500 million for technology development and initial launch contracts worth $2 billion combined. The EELV will eventually replace a number of existing launch vehicles including Atlas, Titan, and Delta. It is one of only two national sites for EELV launches and is expected to launch the first EELV in 2002.

The Air Force base is also home to the California Spaceport, a commercial launch services company. The California Spaceport was the first FAA/AST (Federal Aviation Administration/Associate Administrator for Commercial Space Transportation) licensed commercial launch site. Its license was renewed in 2001 for an additional five years. The Spaceport has payload processing facilities and a commercial launch facility.

The California Spaceport's payload processing facilities support booster processing and administrative activities and are capable of handling all customer payload-processing needs. The Spaceport has provided payload processing services for the NASA Lewis satellite and has contracts to provide payload processing for two Earth Observation System satellites.

The California Spaceport's Commercial Launch Facility (CLF) consists of a pad deck, support equipment building, launch equipment vault, launch duct and stand, communications equipment and launch control room. It will be able to accommodate a wide variety of launch vehicles. The site has launched two Minotaur launch vehicles to date.

Commercial applications at VAFB started in 1987 and since then the commercial space industry has become a major economic generator for the Central Coast of California, especially the Lompoc and Santa Maria areas.

Approximately fourteen companies have agreements with 30 SW and about six that are actively providing commercial space services at VAFB. There are 22 private firms who operate at VAFB including world-class aeronautics firms like The Boeing Company and Lockheed Martin. Over 6,500 civilian employees work at VAFB.

Sea Launch, Home Port and Headquarters in Long Beach

Sea Launch is the world's only ocean-based launch services company providing a direct route to geosynchronous transfer orbit for commercial satellite companies. It is an international company with U.S., Russian, Ukrainian, and Norwegian partners. As described on the Sea Launch Organization website, the partners and their operational contributions are:

- The Boeing Company of Seattle, Washington (40 percent) who contributed the payload fairing, analytical and physical spacecraft integration, mission operations, and Home Port management;
- RSC-Energia of Moscow, Russia (25 percent) who contributed the Block DM-SL upper stage, launch vehicle integration and mission operations;
- Anglo-Norwegian Kvaerner Group of Oslo, Norway (20 percent) who supplied the operational services of the launch platform *Odyssey* and assembly and command ship *Sea Launch Commander* and;
- SDO Yuzhnoye/PO Yuzhmash of Dnepropetrovsk, Ukraine (15 percent) who furnished the first two Zenit-3SL stages, launch vehicle integration support and mission operations.

This corporation has its Headquarters and Home Port facilities in Long Beach, California. At the Home Port facilities, Sea Launch has 150 full time employees. In preparation for an actual launch, the number of employees rises to approximately four to five hundred.

Sea Launch has heavy lift launch capability for commercial satellite customers (typically telecommunications satellites) along with satellite processing facilities and streamlined integration operations. Its equatorial sea launch capability offers the most direct route to geostationary orbit providing maximum lift capacity for payloads or extended spacecraft life. Its inaugural launch was in March 1999. Since then it has launched a number of payloads

including a satellite for DirecTV and twin communications satellites "Rock" and "Roll" for XM Satellite Radio.

At the Home Port facilities in Long Beach, Sea Launch receives customer satellites and processes them for transit to the equatorial sea launch. After receipt of the customer satellite, Sea Launch fuels and encapsulates the satellite in the state-of-the-art Payload Processing Facility then transfers the integrated payload unit into the Assembly and Command Ship for integration with the launch vehicle. Also while at Home Port, a horizontally integrated rocket is transferred to and stored in an environmentally controlled hangar on the Launch Platform, a semi-submersible ocean-going launch platform.

Launch Vehicle Manufacture and Services

Outside of launch facilities, the commercial space industry is largely composed of launch vehicle manufacture and services and satellite manufacturing and services (including ground equipment manufacturing). Remote sensing, the provision of raw data and satellite imagery, is a very small component of the industry.

The commercial launch business, the manufacture of launch vehicles and the provision of launch services, constitutes a small and stable proportion of the economic activity associated with commercial space transportation. Nationally, launch vehicle manufacturing composes about six percent of the total economic activity resulting from commercial space transportation. Six percent translates into $3.5 billion in direct, indirect and induced economic impacts, $1.0 billion in employee earnings, and approximately 29,000 jobs.[3]

Although they are a small proportion of the total economic activity, like spaceports they play an important role in enabling satellite manufacturing and the rapidly growing satellite services industry. The launch vehicles range in size to accommodate various payloads and orbital destinations. Small suborbital sounding rockets include Aries, Scout and Pegasus. Medium size rocket systems examples include the Atlas, Delta II, and Titan II. The largest payloads are associated with the Space Shuttle and the Titan IV.

There are two types of launch vehicles, Expendable Launch Vehicles (ELVs) and Reusable Launch Vehicles (RLVs). ELVS are designed to solely launch payloads into space. These payloads (largely satellites) include commercial telecommunications satellites, weather satellites, and remote observation

[3] ***The Economic Impact of Commercial Space Transportation on the U.S. Economy*** published by the Associate Administrator for Commercial Space Transportation, the Federal Aviation Administration, and the U.S. Department of Transportation, February 2001.

satellites as well as a variety of unique spacecraft. The ELV is made up of one or more rocket stages. Each stage, after expending its propellant is jettisoned back to Earth. Some examples of ELVs are:

- The Boeing Company's Delta II, III, and IV: Boeing's Delta II is considered the "work horse" of the U.S. launch vehicles. It currently launches commercial, scientific and commercial payloads between 14 and 16 times a year, more than any other U.S. launch vehicle. The Delta IV series, developed under a US Air Force EELV contract, is expected to replace the Delta II and Delta II fro the bulk of future commercial and government launches. The Delta IV series can launch payloads of up to 27,000 pounds into GTO.

- Lockheed Martin's Atlas series II, III, and V: Lockheed Martin launches from both Eastern Test Range and the Western Test Range. The Atlas II series is being replaced by the Atlas III series. The Atlas III and V have the capacity to send an approximately 10,000 pound payload into geostationary transfer orbit (GTO).

- Reusable Launch Vehicles (RLVs) are space vehicles that are designed for multiple missions. RLVs are expected to dramatically reduce the cost of access to Low Earth Orbit (LEO), but regular use of RLVs is currently limited by a number of technical challenges. The most famous RLV is the Space Shuttle known for transporting astronauts from LEO and back again.

Satellite Manufacturing and Services

Satellite related manufacturing and services compose the majority of the commercial space industry economic activities and impacts. Satellite and ground equipment manufacturing had the following impacts on the U.S. economy: $31 billion in total economic activity, $9 billion in employee earnings, and responsibility for 271,000 jobs. Satellite services had similar impacts: $25 billion in total economic activity, $6 billion in employee earnings, and 187,000 jobs related to the industry.

The commercial space industry in California has some of the largest and most recognized players in the business including The Boeing Company as well as many smaller, entrepreneurial firms such as DirecTV. California is home to three of the major satellite producers including Boeing Satellite Systems located in El Segundo, Lockheed Martin Commercial Space Systems in Sunnyvale, and Space Systems Loral of Palo Alto. All of these firms have more than 40 years of experience in innovation in spacecraft and satellites with civil, military and commercial applications.

As the California Space Authority notes, satellites manufactured in California contribute to weather prediction, global communications, direct-to-home entertainment, environmental management, navigation, high-speed Internet, scientific exploration, and national security and have applications that benefit key industries such as entertainment, information technology and agriculture.

Profile of Selected Commercial Space Companies in California

This section contains brief profiles of selected firms based in or operating in California. It is important to note that this list represents only a very small portion of the numerous California firms that are engaged in the rapidly growing commercial space business. ERA's intention in including these profiles is to give the reader an idea of the types economic activities that companies in the commercial space industry are engaged in.

The Boeing Company

Boeing Space and Communications headquartered in Seal Beach, California is the largest space-related entity in the world and has 50 years of experience in space-related high technology achievements. The $10 billion enterprise has more than 38,000 employees, of which 36,600 are in California. Boeing Space and Communications reportedly has 25,600 employees working primarily in Los Angeles and Orange County. Another 5,300 are employed by Boeing's launch services which serves both commercial and government customers.

Boeing is a global market leader in commercial and military satellites, missile defense, space exploration, propulsion, and a leading provider of launch services. It is one of four partners in Sea Launch, the world's only ocean-based launch services company. This firm supports the U.S. government in a number of programs including the Air Force's Expendable Launch Vehicle program. It is also NASA's largest contractor and is involved with the program for Space Shuttle rocket engines and in the International Space Station, the largest and most complex international scientific project in history.

DirecTV

DirecTV based in El Segundo, California is part of the Hughes Electronics Corporation, a subsidiary of General Motors Corporation. DirecTV is a direct-to-home broadcasting company that provides digital multi-channel entertainment services. DirecTV is currently the nation's leading digital satellite television provider with approximately eleven million subscribers. DirecTV employs approximately 1,200 people in its El Segundo office.

Lockheed Martin

Lockheed Martin's Missiles and Space Operations designs, engineers and manufactures civil, commercial, and military space systems. Their products include spacecraft, launch vehicles, human space systems as well as the supporting ground systems. This unit of Lockheed Martin has a nationwide employment of 9,400 including 8,000 people California wide and 6,900 in the San Francisco Bay Area alone. Lockheed Martin's Missile and Space Operations works in conjunction with Lockheed Martin's Space Systems who markets, designs, and builds geostationary and nongeostationary telecommunications and remote sensing satellites for customers. The final assembly, integration and testing of Lockheed Martins A2100 satellite series takes place in Sunnyvale's state-of-the-art Commercial Satellite Center. Sunnyvale supports commercial space production activities, spacecraft operations, and an Integration and Test facility. Approximately 1,000 Lockheed Martin employees provide launch support for space systems at Vandenberg AFB. These employees are responsible for pre-launch, handling, assembling, and fueling activities once the launch vehicles arrive in California via aircraft from Colorado. Total Lockheed Martin employment in California is approximately 19,000.

Space Systems/Loral (SS/L)

Space Systems/Loral is a subsidiary of Loral Space and Communications headquartered in Palo Alto, California. It operates in Silicon Valley in 29 buildings that encompass 1.3 million square feet. As a full-service producer of commercial communications and weather satellites, Space Systems/Loral designs, builds, and tests satellites, subsystems and payloads as well as provides orbital testing, procures insurance and launch services and manages mission operations from its Mission Control Center in Palo Alto. SS/L employs approximately 3,100 people and posts annual sales of approximately one billion.

AIRCRAFT AND COMPONENT MANUFACTURING

The commercial aircraft and aircraft parts manufacturing sectors in California are of considerable economic importance, particularly to Southern California. In 2000, the estimated number of individuals employed in these two sectors was 60,000. They include employees that are engaged in manufacturing or assembling of complete aircraft, as well as those in the manufacturing of aircraft components. However, the definition of aircraft is very diverse, and includes types ranging from fixed wing planes and helicopters to dirigibles and hang gliders. An overview of Californians employed in these two sectors is presented in **Table 2**.

Aircraft Manufacturing Sector – Employment and Wages

The commercial aircraft manufacturing sector includes employees working at firms that primarily manufacture and assembly aircraft. The most notable California assembly plant is in Long Beach, where the Boeing 717, a short haul 100- seat commercial jet, is assembled. The California aircraft manufacturing sector accounted for approximately 24,000 employees in 2000, or 40 percent of the number of employees engaged in the aircraft and aircraft parts manufacturing sectors. Wages in the aircraft manufacturing sector are relatively high. In 2000, the average annual wage in this sector was $67,770. This figure is approximately 54 percent higher than the state's 2000 average annual wage of $44,120 and approximately 114 percent higher than the national 2000 average annual wage of $31,600.

Aircraft Parts Manufacturing Sector – Employment and Wages

The aircraft parts manufacturing sector includes employees working at firms that manufacture engines and engine parts, as well as firms that fabricate other parts such as aircraft fins, oxygen systems, and fuel tanks. Employees working at firms that manufacture components that have uses outside of their aircraft parts functionality, such as engine piston valves, exhaust valves, and combustion filters are not included in this sector. In 2000, there were about 36,000 persons engaged in the aircraft parts manufacturing sector; this represented approximately 60 percent of the total number of employees engaged in the aircraft and aircraft parts manufacturing sectors.

Workers engaged in the aircraft parts manufacturing receive relatively high wages, though they are not quite as high as those that workers in the aircraft manufacturing sector receive. In 2000, the average annual wage in the aircraft parts manufacturing sector was $49,809.

Profile of Selected California Firms

The larger California aircraft and aircraft parts manufacturers are identified in **Table 3**, and this table illustrates the concentration of these firms in Southern California. A brief profile of selected California firms in these sectors is presented below.

Advanced Aerodynamics & Structures

Advanced Aerodynamics & Structures is a development-stage enterprise organized to design, develop, and manufacture light propjet and twinjet aircraft. The company wishes to become a dominant player in the market for light propjet and light twinjet aircraft manufacturing. The company is currently concentrating its development plans on the JETCRUZER 500, a six-seat (including pilot), single engine propjet. The company reportedly employs 120 people. Since the company is still in the development stage, and has not yet begun to sell its aircraft commercially, the firm does not generate notable revenues.

The Boeing Company

Boeing reportedly has 36,600 employees in the state of California, the vast majority of whom work in the commercial space industry. Approximately 11,000 employees work for commercial and military airplane programs such a C-17 and the 717. The company's final assembly facility for the Boeing 717 is located in the City of Long Beach. This facility is unique in the aviation manufacturing industry in that it features a moving production line—similar to what the automobile industry employs. Boeing projects that from initial delivery of the first plane (which occurred in 1999) until 2020, buyers will demand 3,000 of these airplanes.

Brice Manufacturing Company

Brice Manufacturing Company manufactures commercial aircrafts seats and seating components, and also performs seat modification and refurbishment services. The company currently works with airlines, airline overhaul facilities, and airplane manufacturers worldwide. Based in Pacoima, the company reportedly generates annual sales of $21.5 million and employs 260 people in California. In 1994, Ducommun Technologies acquired Brice Manufacturing.

C&D Aerospace

Based in Huntington Beach, C&D designs and manufactures aircraft interiors. Examples of the interior products that C&D designs and manufactures are overhead bins, sidewalls, seats, lavatories, ceiling panels, and galleys. Recently, in the wake of the September 11 tragedy, the company has begun to

become more involved in the aircraft security sector by working with airlines to upgrade and reinforce cockpit doors. The company reportedly employs about 400 people and generates annual sales of $250 million.

Driessen Aircraft Interior Systems

Driessen designs, manufactures, and supports a variety of products in the commercial aircraft interior equipment industry. Driessen claims that it is the leader in the global market for galley equipment on civil aircraft. The company reportedly serves nearly all of the world's airline and airframe manufacturers. As the installed base of Driessen's products expands, the company has begun to increase its presence in the after-market services and support sectors. Figure 1 includes pictures of some of Driessen's aircraft galley products. Based in Garden Grove, the company reportedly employs 350 people and generates annual sales of about $43 million.

Ducommun Technologies

Established in 1849 during the California Gold Rush, Ducommun is reportedly the oldest company in California. Ducommun manufactures avionics and cockpit control interface equipment principally for domestic and foreign commercial and military aircraft and space programs. The company manufactures products for the Boeing 717, 737NG, 747, 757, 767 and 777. Foreign commercial aircraft programs include the Airbus Industrie A330, A340 and A340-600 aircraft, Bombardier Business and Regional Jets, and Dash 8. In 2000, the company reported revenue of $165 million (including revenue from Brice Manufacturing). Duncommun reportedly has approximately 1,100 employees in California, including those working at Brice Manufacturing.

Hydro-Aire

Hydro-Aire designs and develops braking systems for a variety of aircraft. The company provides analog, digital, and brake-by-wire systems for all major airframe manufacturers, with the exception of Airbus. The company reportedly employs more than 500 employees in its Burbank headquarters and generates approximately $500 million in revenues per year. The company is owned by Crane Co., a publicly traded, diversified manufacturer.

Sierracin

Sierracin, with a 300,000 square-foot facility in Sylmar, California, is a leading manufacturer of windshields, windows, and canopies for use in commercial, military, and business aircraft. Sierracin produces these products for leading aircraft companies, including Boeing, Airbus, Canadair, Cessna, Dornier, Embraer, Falcon, Fokker, Lear, Nihon, Raytheon, Rockwell, and Sikorsky. In

addition, the company also has a Burbank-based division that fabricates high technology fluid settings, metal seals, and installation tooling for use in the aerospace industry, as well as in the nuclear and ordnance industries. The company reportedly employs 360 individuals at its Sylmar location and generates annual sales of nearly $80 million.

APPENDIX: SPACE IS AN INTEGRAL PART OF CALIFORNIA LIFE[4]

Commercial space transportation and related enabled industries produce a wide range of value-added benefits in addition to the immediately quantifiable positive economic impacts on the California economy. The following hypothetical chronology of daily activities illustrate some of the many and varied benefits that commercial space and enabled industries provide to the average Californian.

7:00 a.m. After waking up, you turn on your TV and watch the local news. You are one of the millions of Californians who watch the local news to receive the latest weather information. Nearly all the local TV stations in California use the weather forecasting data provided by U.S. government satellites.

8:00 a.m. While you drive to work, traffic reporter on the radio informs drivers of the congested highways and offers alternatives. Since urban planners use satellite imagery to plan construction of the office park and transportation corridors, your commute to the office is probably several minutes shorter than it would be without the use of satellite maps.

8:30 a.m. At work, you log on to your computer, and begin sending emails to clients across the country. Your firm could be one of a growing number of businesses in California who are connected to the Internet by satellite. A growing number of Internet Service Providers are using satellites as part of their Internet backbone.

10:00 a.m. You drive to a meeting across town and stop at a gas station. You use a credit card to pay for the gas at the pump. Satellite technology approves your credit card at the point of sale. Very Small Aperture Terminals (VSATs) are used in about half of all gas stations for instantaneous point of sale transactions.

[4] Adapted from Appendix B: Space is an Integral Part of Daily Living in ***The Economic Impact of Commercial Space Transportation on the U.S. Economy*** published by the Associate Administrator for Commercial Space Transportation, the Federal Aviation Administration, and the U.S. Department of Transportation, February 2001. The chronology is adapted for California based on a national chronology provided in the Appendix.

12:00 p.m. At lunch you receive three pages on your beeper from clients in Texas, Florida and Massachusetts. You are one of the millions of Californians who rely on satellites for national pager coverage.

1:00 p.m. After lunch you return to the office and make some international phone calls that are routed through an international satellite network. Every time you make an international phone call, call an associate on an airplane, or contact a client in a remote location overseas, you are using satellite telephony services.

3:00 p.m. During the afternoon you receive faxes from international and domestic clients, track a package, and engage in a videoconference, all via satellite.

5:00 p.m. As you drive home you listen to the car radio. Satellites are now part of the traditional national radio broadcasting systems that transmit programs to local stations. You could be one of the early adopters of the new direct satellite radio service that offers up to 100 digitally encoded radio channels without static interruptions or loss of reception.

6:00 p.m. On your way home you stop to rent a movie, pick up your prescription at the local pharmacy, and go to the grocery store. Some of the retail chains you patronize use VSAT networks to transmit credit, debit and check authorization information. VSAT networks also help to keep retail costs down by providing point of sale inventory tracking.

8:00 p.m. After dinner, you relax and watch TV. Your direct-to-home (DTH) television system offers video content directly into your home using a dish antenna. Satellite equipment help to gather news used in local and national news shows, especially for live transmission of breaking news. Sporting and other events like elections rely on satellites for immediate transmission.

Table 1
CALIFORNIA STATE AND FEDERAL AGENCIES WITH AVIATION PROGRAMS

Agency	Annual Budget	Staff[1]	Aircraft
California State Agencies			
Dept of Fish and Game, Air Services	$886,750	8	7 Fixed wing aircraft
Dept of Forestry and Fire Protection, Aviation Management Program	$15,000,000	148	36 Fixed wing aircraft, 9 helicopters
Dept of Justice, Mission Support Branch- Aviation Operations	$1,900,000	10	9 Fixed wing aircraft, 4 helicopters
Dept of Transportation, Division of Aeronautics	$2,800,000	30	2 Fixed wing aircraft
California Highway Patrol, Office of Air Operations	$4,100,000	153	14 Fixed wing aircraft, 9 helicopters
Federal Agencies			
US FAA	$296,472,000	4,000	
NASA Ames Research Center	$120,000,000	1,400	
NASA Dryden Flight Research Center	$44,000,000	600	
NASA Jet Propulsion Laboratory	$300,000,000	5,200	
US Customs Inspectors			
US Customs Air and Marine Interdiction Division	$10,000,000	170	17 Fixed wing aircraft and helicopters
USDA Forest Service, Regional Air Group	$16,000,000	19	8 Fixed wing aircraft
US Drug Enforcement Administration	$1,100,000	14	11 aircraft
US INS Border Patrol	2,900,000	42	5 Fixed wing aircraft, 17 helicopters
US Marshals JPATS			
US Postal Service			
Total	**$815,158,750**	**11,794**	

[1] Includes contractors.
Source: Various agencies and ERA.

Table 2
EMPLOYEES IN THE AIRCRAFT MANUFACTURING, AIRCRAFT PARTS MANUFACTURING, AND OFF-AIRPORT REPAIRS SECTORS

	2000	
	Number of Employees	**Average Annual Wage**
Aircraft Manufacturing[1] (SIC 3721)	23,731	$67,770
Percentage of Total	39.7%	--
Aircraft Parts Manufacturing (SIC 3724 & 3728)	36,046	$49,809
Percentage of Total	60.3%	--
Total	**59,777**	**$56,939**

[1]Includes employees engaged in off-airport aircraft repair.

Source: Bureau of Labor Statistics, California EDD, and ERA

Table 3
SELECTED AIRCRAFT AND AIRCRAFTS PARTS MANUFACTURING COMPANIES IN CALIFORNIA

Company Name	Location
Boeing	Long Beach
Ivoprop	Bellflower
Advanced Aerodynamics & Structures	Long Beach
Derringer Aircraft	Mojave Airport
Rohr, Inc.	Chula Vista
GKN Aerospace Chem-Tronics	El Cajon
Robinson Helicopter Company	Torrance
Arrowhead Products Corporation	Los Alamitos
SCS Acquisition Corporation	Sylmar
General Atomics Aeronautical Systems	San Diego
Hydro-Aire, Inc.	Burbank
Rockwell Scientific Company, LLC	Thousand Oaks
Composite Structures, LLC	Monrovia
Aerospace Dynamics International	Santa Clarita
Rolls-Ryce Engine Services-Oakland	Oakland
ADI Industries	Valencia
C&D Aerospace, Inc.	Huntington Beach
Marvin Engineering Company, Inc.	Inglewood
Sierracin Corporation	Sylmar
Driessen Aircraft Interior Systems	Garden Grove
Thales Avionics Inflight System	Irvine
Burbank Aeronautical Corporation	Burbank
AHF-Ducommun, Inc.	Gardena
Applied Aerospace Structures	Stockton
HITCO Carbon Composites, Inc.	Gardena
Jet Products Corporation	San Diego
Brice Manufacturing Company, Inc.	Pacoima
Regent Aerospace Corporation	Santa Clarita
Hydroform USA, Inc.	Long Beach
Paul R. Briles, Inc.	Gardena
Teledyne Analytical Instruments	City Of Industry
Universal Propulsion Company	Fairfield
Luxfer, Inc.	Riverside
P.L. Porter Controls, Inc.	Woodland Hills
4/Flight Industries, Inc.	Ontario
J.C. Carter Company, Inc.	Costa Mesa
PTI Technologies, Inc.	Oxnard
Ducommun Technologies, Inc.	Carson
TMW Corporation	Sylmar
Adams Rite Aerospace, Inc.	Fullerton
Integrated Aerospace Systems	Santa Ana
Neill Aircraft Company	Long Beach
STL Enterprises, Inc.	Sylmar
TAG Aviation USA, Inc.	Burlingame
Del Mar Avionics, Inc.	Irvine

Source: Dun & Bradstreet

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National Aeronautics and Space Administration, http://www.nasa.gov

U.S. Census Bureau, http://www.census.gov

U.S. Customs, http://www.customs.ustreas.gov

U.S. Customs Air and Marine Interdiction Division,
http://www.customs.ustreas.gov/enforcem/air1.htm

U.S. Department of Agriculture, Forest Service, http://www.fs.fed.us/fire

U.S. Department of Justice, Drug Enforcement Agency,
http://www.usdoj.gov/dea

U.S. Federal Aviation Administration, http://www.faa.gov

U.S. Immigration and Naturalization Service Border Patrol,
http://www.ins.usdoj.gov/graphics/lawenfor/bpatrol/index.htm

U.S. Marshals Service, http://www.usdoj.gov/marshals

U.S. Postal Service, http://www.usps.com

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